

## LA-UR-17-30312

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Intended for: Poster for highlighting facilities to visitors

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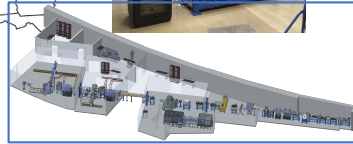
# Shock and Detonation Physics Group

SLAC Linac Coherent  
Light Source  
Stanford, CA



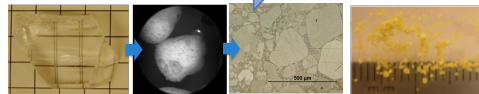
● Collaborators

Dynamic Compression Sector  
at Advanced Photon Source  
Argonne National Laboratory

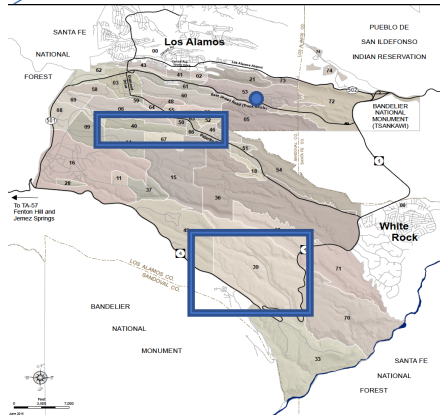


**Crystal Laboratory**

TA-40-12 → TA-16-303



- Sole national resource for growth and sample preparation of large HE single crystals
- Synthesis, recrystallization, formulation, characterization, and testing of weapons stockpile explosives
- Sample prep for 1st ever in situ x-ray measurements on explosives at 3rd and 4th generation light sources.
- FY19: Relocating from TA-40-12 to a newly renovated facility at TA-16-303; Return TA-40-12 to firing chamber to accommodate increasing workload for Crystal Lab



**Ancho Canyon Facility  
(TA-39)**

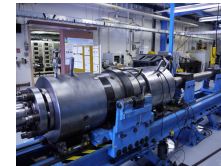
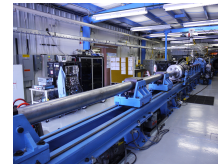


**Dynamic Equation of State  
Facility (TA-40)**



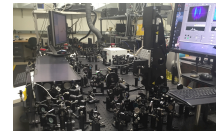
- 40 mm powder gun
- 28 mm 2-stage powder gun
- 51 mm gas gun
- We use gas and powder guns (velocities of 0.15 to 8 km/s), explosive charges, and magnetic drives to drive shock/isentropic compression waves into materials.
- Computational tools, such as hydrodynamic wave codes (one- and multi-dimensional) and molecular dynamics, are used in conjunction with experimental results for material model development [EOS, strength, damage].

**TA-40 Chamber 9**



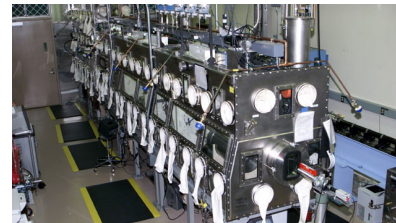
- 72mm Single-stage gas gun - Projectile velocities of 1.5/km/s
- 50mm two-stage gas gun - Projectile velocities of 3.2 km/sec
- Multiple magnetic ganging in HE up to 3.2 km/sec
- Sub-nanosecond VISAR measurements
- Pins and pressure gauging
- Streak spectroscopy measurements

**Laser Laboratory**



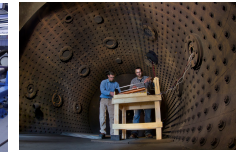
- Ultrafast laser laboratory for HE and weapon material science
- The team has developed unique table-top, high-repetition-rate laser-shock generation and characterization techniques
- Use spectroscopic and interferometric methods to measure dynamic material response
- Complementary capabilities are employed in: static spectroscopies; thin-film growth and characterization; femtosecond micromachining of explosives for controlled defect ("hot spot") studies

**Powder or Gas Gun  
(TA-55)**



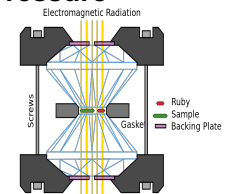
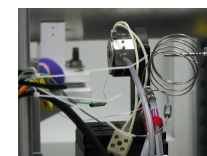
- Equation-of state, dynamic strength, spall strength, phase stability, and phase transition data on actinides such as Pu and U as well as other hazardous materials.
- Diagnostics include VISAR, PDV, PZT impact pins and radial velocity pins. A recent upgrade added the capability to perform heated target experiments

**TA-40 Chamber 8**



- Largest containment vessel by volume at LANL
- High Speed Framing Camera (mechanical and electronic)
- High Speed Streak Camera (mechanical and electronic)
- High Speed Digitizers 12 Channels
- VISAR system for velocity measurements
- Only indoor firing site at Los Alamos
- Interlocked Firing area that eliminates the need for clearance patrolmen.

**Static High Pressure**



- Understanding the behavior of materials at extreme pressures and temperatures
- Bridging static and dynamic strain rates
- Fundamental understanding of electronic and structural properties
- Pressures of 3.5 megabar and temperatures to 5000 K can be achieved with diamond anvil cell technology

**Powder Gun at pRad  
(TA-53)**



- 40 mm powder gun
- Coupled with proton radiography allows a direct density measurement to study phase changes, hydrodynamic mixing and penetration characteristics.
- Capable of flyer velocities of 0.9 and 2.0 km/s.